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Dissertation on necrosis

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IX.

Dissertation on Necrosis

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Necrosis.

This term signifies the death of bones, and is derived from the Greek νεκρω, to destroy, and is similar to mortification of the soft parts.

This disease was not distinguished by the Ancients from Caries, although the two affections are essentially different. In the one, the bone is entirely deprived of its vitality, in the other its texture is altered, and its nutrition impaired, without its vitality being destroyed.

The one is analagous to mortification of the soft parts, the other to ulceration.

This disease most frequently affects the long boned, and of these the tibia is by far the most liable to be attacked. Persons under the age of puberty, and of a Strumous constitution, are the most frequent subjects of Necrosis.

The compact substance of the bone, where the vital principle is less energetic, and more easily destroyed, is oftener the seat of this disease, than the spongy substance, which is more vascular.

The extremities of a bone often remain unaffected, when the body or middle is destroyed, the disease being confined to its centre of ossification.

Authors have divided this disease into two varieties, and three different stages. Simple, when confined to one bone, and the patient is, in other respects healthy. Compound, when several different parts of the same bone, or several distinct bones, are affected at the same time; or when the patient is suffering from some other complaint. The first stage, embraces the period, during which the destruction of the bone is effected, the second, includes the process of exfoliation, the third, is the period in which the separation of the dead portion is completed.

Necrosis, may arise from a variety of causes. An interruption in the nutrition of the periosteum or the bone itself, may be regarded as a primary cause. Some of the causes are external, while others are internal or constitutional. Sometimes, the life of the bone is instantaneously destroyed, at others,

preceded by inflammation. The external causes which injure the periosteum and medullary structure, and thus produce Necrosis are, Wounds, fractures, Contusions &c. exposure to heat and Cold, combined with moisture, or the body being suddenly chilled when in a perspiration. In most cases an internal Necrosis proceeds from Constitutional Causes, though an external Cause may extend its action to the interior, and so affect the medullary membrane, as to produce the disease. Those causes of a Constitutional Character, are, Scrofula, Scurvy, Syphilis &c. In some Cases the disease cannot be traced to any particular Cause.

The commencement and progress of Necrosis is extremely deceptive. In a common case following exposure, in the course of eight or twelve hours a severe pain is felt in the leg below the knee. Upon examination no alteration is found in the appearance of the part, there is no tenderness on pressure, nor any swelling, thus

inducing a belief that it is simply a rheumatic af-
-fection. If the disease is seated in the tibia, the pain
is not felt at first at the place of inflammation, but
the ankle or knee joint is complained of. A difficulty
is thus presented in the diagnosis, and young prac-
-titioners are particularly apt to be deceived.

In order to form a correct judgment, it is of
the first importance to enquire into all the symptoms,
by which we may be enabled, not only to ascertain
the presence of the disease, but its modifications
also. We should endeavor to acquaint ourselves with
every thing which may have predisposed to the disease;
whether the patient has met with any accident, and if
so, what symptoms supervened. Whether the patient
has been subject to scrofula or Syphilis, and what
treatment may have been adopted, for in some cases,
injudicious remedies may cause the disease.
The kind of inflammation with which the patient
is affected, may serve as a guide in forming a diagnosis.
The inflammation in this disease is generally slow

in its progress, and the attendant symptoms severe.

For the first twenty four hours, there is no change in the skin; its natural color is retained, but after this period, it presents a livid and shining appearance.

This disease has been confounded with other morbid affections of the bones, but if attention be paid to the discriminating circumstances, such errors may be avoided. In other affections of the bones there is not that peculiar and severe pain in the commencement, followed by discoloration of the skin; and the swelling in Necrosis is not circumscribed. These with other circumstances, are sufficiently obvious, to guide the surgeon in his diagnosis.

It is a matter of great satisfaction to the surgeon to be aware, that, although the disease is always tedious and painful, it is not of a dangerous character. I believe that it is now a well authenticated fact, that it never affects a

part essential to the preservation of life.

The disease in the superior extremities, is always without danger, and is seldom fatal in the lower extremities. When the stage of inflammation is very violent, and rapidly succeeded by the other stages, the case is more severe and dangerous.

The excessive pain, extensive irritation, and copious discharge of matter, preceding the reproduction of bone, soon induce hectic fever, and the patient is sometimes so far reduced, as to be unable to conflict with the severity of the complaint; but even in such cases, where every thing appears so unfavorable, amputation may be resorted to, and the patient's life probably saved.

If the patient possesses sufficient strength, to pass through the incipient stage, a favorable issue may be expected, for there is no particular danger during the formation of new bone. There is generally an increase of the pain and distress, when the separation becomes loose, and endeavors to

force its way to the surface, and often a high de-
-gree of irritation succeeds, with ulcerations of an
unhealthy appearance, followed by violent fever,
and the patient sometimes is placed in consid-
-erable danger, from this source. If he is able
to resist the secrete of the disease, the sequestra
are cycled, and a cure effected. In this stage,
we may be enabled to judge of the danger to
which the patient is exposed, from the effect
which the disease produces upon the general
health.

As an illustration of necrosis, I
cannot do better, than relate my own case.

Upon rising in the morning, I detected a dull,
wandering, deep seated pain, apparently occupy-
-ing the whole length of the tibia. By pressure
upon the limb, this pain appeared to be reliev-
-ed in a great measure. I found that when I
walked, I was obliged to limp considerably.
As the inflammation increased, the sensibility

of the parts became much greater. Neither the size nor the shape of my limb was altered for some time, nor was there any change in the appearance of the skin. In a short time the pain increased, so as to become almost insupportable, and decisive symptoms of inflammation made their appearance; there was great tenderness on pressure, increase in the size of the limb, which enlargement could be traced along the course of the tibia. With the increase of the swelling and pain, there was great nervousness, sleeplessness, and increased activity of the pulse. At this stage of the disease, there is generally delirium.

The diffusion of swelling varies in proportion to the depths of the diseased bone from the soft parts; if the bone is deeply seated, the swelling may involve the whole limb.

The tumefaction and tenderness increased, as also did the pain and restlessness, and was only relieved by an incision down to the bone, thus giving vent to a vast collection of matter. There is

generally no diminution in the severity of the symp-
-toms, until an opening is formed, for the pus is
bound down by the periosteum and firm fascia.

When the inflammation is acute, purulent
matter of a good quality is formed, and the abscess
soon bursts; but in chronic cases, the pus forms
slowly, and is thinner and less healthy. In these
cases, when the bone is deeply situated, the quantity of mat-
-ter gradually increases, enlarging the cavity, and the cel-
-lular substance yielding, different sinuses are formed, of-
-ten running a great distance from the seat of disease.

The discharge of purulent matter is always very great,
and after a time the sinuses receive the name of fis-
-tulæ, and though rarely presenting an unhealthy aspect,
show great indisposition to heal. These fistulæ vary
according to the extent and severity of the disease; some-
-times appearing over the whole surface of the limb.

At this stage, small spiculæ of bone, sometimes pass
through the external openings, along with the purul-
-ent matter. This was the case with me; three pas-

-ed out without causing any irritation, or giving any pre-
vious intimation of their approach.

As long as the patient's general health remains good,
the discharge from the ulcers is white and laudable, but
degenerates according as the health is impaired.

After the formation of these external openings, it is
important for the Surgeon to ascertain the extent of the
disease of the bone; whether the dead portion is detached,
and whether it is a superficial portion of the bone.

If the openings are sufficiently large, the necessary
examinations may be made by the finger, and if not,
a probe may be used, by which means the Surgeon
can generally satisfy himself in regard to this point.

Internal Necrosis differs in some respects
from the form just described; it is generally more severe,
and of longer duration. The symptoms in the first
stage, are more dangerous than in the other variety;
the pain is of the severest kind, the fever very high,
continued loss of rest, profuse perspirations, all of
which tend to prostrate the system. The swelling

increased slowly, and the pain which is fixed in the bone is not augmented by handling the parts roughly; the swelling does not decrease, by the evacuation of matter, as in the external disease, and by pressure upon the part, the quantity of the discharge is not increased.

When we have this combination of symptoms, and find the limb unable to bear the action of the muscles, or the weight of the body, and that its shape becomes altered, we may conclude that it is a case of internal necrosis.

We may be enabled to judge of the extent of the disease, by passing a probe through the openings in the subjacent bone, and measuring the distance between them, as the sequestra can generally be felt through them.

There are two distinct terminations to Necrosis, which are described particularly by Russell. In the one, the mildest and most desirable termination, the ulcerations gradually heal up without exhibiting any unusual appearance.

The sequestrum is never seen; the patient soon re-
-gains his health, and no vestige of the disease re-
-mains. The other termination, is attended with
more curious and interesting circumstance, the seques-
-trum forming a conspicuous figure. It appears ex-
-ternally, by forcing a passage for itself, through the
new formed bone, and common integuments. Some-
-times this happens, without being preceded by any
considerable suppuration, and the degree of pain and
inflammation is very moderate. The case however, is
different, when the protrusion of the bone is preced-
-ed by profuse suppuration; for then the pain is
often very great, and does not abate until a natur-
-al or artificial opening of the abscess, has remov-
-ed the tension and irritation.

The extremity of the sequestrum, at the time of its
protrusion is always rough, irregular and sharp, but
is generally firmly wedged in the neighboring part,
so that it cannot be extracted until it becomes loos-
-er in consequence of the consumption of a part

of its own substance, and parts from the wasting of the new formed osseous shell, by pressure. In other cases, a part of the middle portion of the sequestrum presents; the new shell of bone incloses it on every side, thus preventing the motion of the sequestrum, except in the direction of the cavity. It is difficult to say, what would be the final result of such a case, if left to itself, since the assistance of art, is so highly necessary to complete the process, that the conclusion of the Case is never left to the spontaneous efforts of nature.

In the early stages of necrosis, the internal surface of the new osseous shell, sends out granulations from every part of its surface, which rise in all directions and grow rapidly, gradually diminishing the size of the cavity, left by the removal of the dead portion of bone. At last they unite together, and form one solid mass, which entirely obliterates the cavity. Thus in cases of the removal of the sequestra, whether by absorption or suction, the substitute

bone becomes solid instead of hollow. The ejection of the sequestrum indicates a moderate degree of inflammation, but when it separates more quickly, and while the new bone is in a soft state, the inflammation is severe, accompanied with violent symptoms, and with the temporary suspension of the motion of the limb. This premature separation is of more frequent occurrence in the lower jaw. Sometimes the sequestrum separates from the old bone at both its extremities, at an early period of the disease, and the patient loses the use of the limb for the time being.

In that form of necrosis, where the sequestrum is removed by dissolution and absorption, without appearing externally, the disease is more uniform in its progress. The process is necessarily tedious, and accompanied with a profuse discharge of matter; but besides the general enlargement of the bone, this is the only striking circumstance which occurs. In young subjects, the dissolution

takes place more speedily than in those of more mature age. The sequestrum being separated from its attachment, probably runs its decay to the spontaneous decomposition which all parts of the body naturally undergo, when they are deprived of life, and detached from the system, aided by the solvent power of the purulent matter which surrounds it. This constant maceration facilitates the spontaneous decomposition of the detached bone, and prepares it to be removed by absorption, or to be washed out along with the discharge.

This termination by absorption is denied by Liston. He remarks, that a small portion of bone in the central part of a bone dies, and violent inflammation of the whole bone is the consequence, even though the exciting cause be slight.

This inflammation action continues for a long time, and either the small portion of dead bone, is discharged unnoticed with the pus, or it becomes encased, and ultimately lies dormant in the cav-

-tre of the bone. The external opening then heals, and the case is supposed to be one, in which the dead bone has been absorbed. He says, there is no such thing as any absorption of bone after once it has become dead. In order to prove his assertion he mentions an instance, of a sequestrum composed of nearly the whole internal shell of the humerus, the upper part of which presented just under the shoulder; and as all of it could not be extracted, he removed as much as he could reach with the cutting forceps. The opening now closed, and the sequestrum remained for a long time bathed in the fluid which filled up the medullary cavity, whilst the process of absorption was slowly going on in the neighbouring living bone. At length when separation had taken place sufficiently to allow the sequestrum to be moved about, a fresh incision was made over the shoulder, and the whole of the sequestrum removed, which appeared rough and had apparently corroded edges, except at the

upper part, where the bone forceps was applied, which was smooth and sharp, as when it was just cut through, clearly showing that no absorption had been going on in the actually dead bone, though it had been proceeding in the living bone in close contact with it. He also mentions several experiments made by himself and others. Small smooth pieces of bone, previously weighed, were introduced and kept in tissues, instead of peas or other foreign bodies.

Pieces of bone were also introduced into the medullary cavities of the long bones of rabbits and other animals, and after leaving them in for several weeks, the animal was killed, and the state of parts examined. The bone which had been introduced, was never in the slightest degree eroded, nor was there any diminution in its weight. In some cases, the dead pieces of bone were observed cemented to the sides of the medullary cavity by new osseous matter thrown

out by the living bone. This appears to be the opinion of the Surgeons of the present day.

The duration of a case of Necrosis will vary a great deal, depending upon the age and vigor of the patient, on the size of the bone diseased, and the action of the blood-vessels of the part. The younger the patient is, the more expeditious the process, as the bones are of smaller size, and are possessed of more vascularity. The lower jaw, generally occupies less time, than other bones, and the tibia is the most tedious.

Taking a case of the disease in the tibia, from the commencement of the pain, till the final termination of the case, when all the ulcerations have dried up, and the new bone become consolidated, generally occupies at least twelve months, very often a longer period. In my own case, it was several years. In cases of long duration the patients health is not impaired, in any proportion to the alarming appearance of the

symptoms. The duration of a case, admits of considerable latitude, even in patients of the same age, and when the same bones are affected.

It is of the utmost importance, that the Surgeon should appreciate the powers of nature in the cure of necrosis; he should endeavor to aid her in her salutary efforts, and not interfere by unnecessary medication or operations: but if he should find her unable to accomplish a cure, he should not hesitate to interpose his aid, for the safety of the patient.

Nature displays her power of reproduction more remarkably in this disease, than in any other. The formation of new parts in an ulceration is extraordinary and wonderful, that we might be disposed to doubt its reality, were it not that we are presented with numerous examples of the fact.

After the entire body of the original bone, the formation of a substitute one, enables the patient to perform

all the usual actions of the limb, without sensible inconvenience or difficulty; and in favorable cases, the power of motion is preserved during all the changes which occur. We can thus infer that the new bone must have begun to grow, and have acquired firmness, before the separation of the old bone, otherwise the patient would be unable to use his limb during all this period. Another consequence of the formation of new bone, anticipating the separation of the old, is that the new bone should surround and include the old one. The dead portion completely occupies the space between the two living extremities, and the new bone can only attach itself to the live portions, by passing over it; and from this fact, we know that the new bone must be larger than the old. Upon this account the affected limb will be larger, and out of proportion to the other limb, having also a rough irregular surface.

This process of reproduction is more frequent and complete in the long than in the flat bones.

To what organ is to be ascribed the function of reproducing bones? By many the whole work is conceded to the periosteum; this was the o-pinion of Mr. Du Hamel, of Paris and others. This opinion is adopted by Dr. Gibson. Others Contend that it springs from the substance of the old bone. Liston states that the formation of the substitute bone proceeds from those extreme points of the old bone, which retain their vitality, and takes place under the thickened and swollen periosteum; for the bony tissue alone seems to have the power of assimilation, as it were, and of causing the deposition on its surface of new osseous matter.

Russell states, that the fusiform mass which exte.ds from one portion of the bone to the other, and is itself at last converted into bone, is entirely a new creation, and has no dependance upon the original bone, or its periosteum.

That however, the periosteum is the organ of re-production, is now the general opinion of Surgeons

experiments having frequently been made, showing that there was a reproduction, though nothing was left of the old bone except the periosteum.

If at different periods of development, the new bone be examined, we perceive at first a reddish fluid, thin and small in quantity, which gradually increases, until it becomes a gelatinous substance, in this, bony fibres are developed, which become more and more numerous, until they form layers and cells, extending in every direction; so that, at length all the fluid disappears, and the new bone takes its place, gradually becoming denser and harder, until it acquires the ordinary consistency and color of bones.

When a portion of bone dies, nature uses all her endeavors to bring about its separation from that part which still remains alive. This separation is effected more rapidly in youth, when the bones are possessed of less earthy matter, than in old age. The smaller the portion to be detached, the quicker will the process be finished.

This separation takes place sooner in bones of a light texture, than in those of a solid structure.

There has been great diversity of opinion, in regard to the means employed by nature, in effecting this separation. It was the opinion of Hippocrates, and of other of the old physicians, that the dead part was pushed away, by means of a fleshy substance which grew underneath; while others believed that the dead part was forced away, by the incessant beating of the arteries. Modern theories teach that the dead portion of bone is separated by the process of absorption, precisely in the same manner that mortified parts, are separated from the living, in Cutaneous, muscular, and other structures: the part of the living bone in immediate Contact with the dead portion is absorbed by the proper vessels, and the sequestrum is ultimately left free.

We are now led to consider under what circumstances, the intervention of the

art of Surgery is necessary and proper, in cases of Ne-
-crosis. In the Cure of this disease too little credit is
given to the efforts of Nature, and success are of-
-ten boasted of which properly belongs to her; in fact
in many cases double honor is due her, for she
has to contend, not only against the disease, but
also against the baneful influence of injudicious
treatment. If Credit is to be given in all cases
recorded, to the power of medicine, we have a multi-
-tude of wonderful cures, performed by every possi-
-ble mode of treatment; by balsams, cold water, Steam,
vapor, and other modes of application of warm water,
acids, Caustics &c. There is much reason to ques-
-tion, whether any real benefit can be derived from
the use of topical applications. It is true, the
disease Commences with inflammation, but this
inflammation is of a peculiar kind, being always
so deep seated and severe, that it is extremely diffi-
-cult to Control it by local treatment. Still it is
our duty to endeavor to alleviate the sufferings of the

patient by any means in our power, and a trial of the usual means of counteracting inflammation should be made, as topical blood letting, cooling applications &c. A variety of remedies have been proposed, to accelerate the process of the separation of the bone, but they generally do more harm than good.

Acrid substances have been recommended for this purpose, to be placed upon the dead portion of the bone, but they can only prove irritating, inflaming and destroying the surrounding parts, and causing a great deal of pain to the patient. The actual cautery, gouging instruments &c. are very apt to cause new inflammation, and increase the sufferings of the patient. The internal remedies which have been so much lauded in necrosis, as Sarsaparilla, hemlock &c. do good probably by their tonic and alterative powers, enabling the patient to bear the disease better than he otherwise would.

The preparations of iodine, by their internal and external use, may accelerate the separation of dead bone, by increasing the activity of the absorbents, and

hence their utility in some cases.

In the commencement of the disease, when the inflammation and fever is intense, we should endeavor to palliate the severity of the case by low diet, antiphlogistic remedies, and venesection, not however carried to any great extent, as the patient has to contend with a severe disease of long duration. When the necrosis arises from Scrofula, Syphilis &c. the remedies calculated for the Cure of these diseases, should be used; the preparations of mercury, Iodine &c. Narcotics should be given in all varieties of the disease to relieve pain and to subdue nervousness. When these methods of treatment fail, recourse may be had to incisions. The inflammation is deep seated, and covered by unyielding tissues, which prevents the swelling of parts, and causes excessive pain; the object of the incision is to free parts from this pressure, not to give exit to matter. The duration of the disease is often shortened by this practice. The incision should be made down to the parts affected, and if matter has

collected, it is discharged, and it often happens that the disease is prevented from extending. If when this incision is made, the bone is found altered in color, and the pain is not relieved thereby, it is probable that the inflammation is deeper, in the cavity of the bone. An incision is then to be made through the bone by the trephine, cutting a portion entirely out. An ulceration will be found in the cavity, it may be filled with a bloody serum, or if later, pus may be formed; the matter must find its way to the surface, before restoration can take place. This treatment is of recent date, but has the sanction of very high authorities.

When loose fragments of bone present, it is the duty of the surgeon to remove them, as they prove a source of irritation, and prevent the healing of the ulcers in the soft parts; but he should be careful to ascertain that they are detached, as it would be injurious to pull them away forcibly. These fragments can be removed by the forceps, or the finger

if sufficiently perforated; and if the external opening is too narrow, it may be enlarged. In some cases there is more difficulty, the sequestrum being included in a cavity of the new bone.

When we have discovered for certain, that the bone is loose, by means of the probe, we are warranted in cutting down for the purpose of removing it. This operation is generally well borne, and after the removal of the diseased portion, the ulcers generally heal, the health is reestablished, and the functions restored. The surgeon should endeavor to ascertain satisfactorily, the presence of the dead portion, and to assure himself that it is loosened from its attachment, previous to the operation. If possible, it is better to operate as soon as the sequestrum is loose, as the new bone is then so soft, that it can be cut with a knife, and thus the operation may be materially shortened. An incision is to be made down to the bone containing the sequestrum. In dividing the

soft parts, there is generally considerable hemorrhage, as the tissues are condensed, and the blood-vessels cannot easily retract. If the cavities in the new bone are too small to admit of the removal of the sequestrum, they may be enlarged by means of Hey's saw, or other instruments. If there are no apertures in the new bone, an opening may be made by the trephine. When this is accomplished, the surgeon must take hold of the dead bone with a pair of strong forceps and extract it; it is essential to remove every portion, or no cure will follow.

In some cases, where the bone is hard and thick, the gouge and mallet is resorted to. This operation was formerly much more in vogue, than at the present day. It is still the favorite operation of some surgeons. I witnessed one operation of this nature, performed by Prof. Horner, at the Clinic of the University of Penn.a, in October last, which proved successful. Generally, relief can be afforded, by a resort to milder measures.

after the removal of the sequestrum; if the new bone is not strong enough to support the patient, the limb may be placed in splints; but this is seldom required. Cases sometimes occur in which amputation affords the only chance of saving the patient's life; as for instance, when the cavities containing the sequestra, extend to the neighboring joints, and Caries takes place, or a large number of dead portions occupy separate cavities, causing great irritation and distress. I saw this operation performed by Prof. Knight of this Institution, upon Mr. P. of West Haven, in the Spring of 1843. The patient had been suffering from necrosis of the Tibia, for a number of years, and his limb was useless. The limb was removed a short distance above the Knee, and the operation proved completely successful. Upon examination the whole Tibia was found to be diseased, and the Knee joint was involved.

When Necrosis is complicated with some other

disease in its vicinity, or when the patient's strength is so much reduced, that he will not be able to contend with the severity and duration of the disease, Amputation is necessary, and should not be delayed.